FECUNDITY OF *ARATUS PISONII* (DECAPODA, GRAPSIDAE) IN UBATUBA REGION, STATE OF SÃO PAULO, BRAZIL

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ABSTRACT

The average fecundity of the mangrove tree crab *Aratus pisonii* (H. Milne Edwards, 1837) from a mangrove area in the Ubatuba region (23° 29' S and 45° 09' W), State of São Paulo, Brazil was determined. Only ovigerous females with eggs in early stage of development were used. The average fecundity was 15,197 ± 5,771 eggs, which increases according to weight and carapace width. The relation between the number of eggs (F) and the cube of carapace width (C) may be represented by the equation F = 3,714.6 + 1.67 C and the relation between number of eggs and weight (W), by the equation F = 1,701.32 + 5,339.8 W. The variation found in the number of eggs in the different size classes is discussed.

KEYWORDS. Grapsidae, fecundity, *Aratus pisonii*, mangrove, Brazil

INTRODUCTION

The tree crab *Aratus pisonii* (H. Milne Edwards) like other sesarmine crabs, plays an ecological role constituting the basis of the herbivorous trophic chain in mangrove regions, participating in the recicling process of nutrients and in the exportation of biomass and energy to adjacent coastal areas (Beever **et al.**, 1979). This especies is widely distributed in the western Atlantic from central Florida to Brazil, and in the eastern Pacific from Nicaragua to Peru (Melo, 1996). It presents great plasticity in some aspects of its life history, becoming an excellent object for comparative studies (Warner, 1967; Díaz & Conde 1989; Conde & Díaz, 1989b).

Fecundity, i.e., the number of laiden eggs per female per brood, constitutes an important information which is used for the determination of the reproductive potential and population stock (Fonteles-Filho, 1989). Furthermore, it provides subsidies for the understanding of the reproductive strategy of species (Stearns, 1976; Christiansen & Fenchel, 1979; Sastry, 1983).

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The aim of this work was to determine the average and individual fecundity of a population of *A. pisonii* in an estuarine mangrove in Ubatuba region.

MATERIAL AND METHODS

Monthly samples of *A. pisonii* were collected in an estuarine mangrove (23° 29' 24'' S; 45° 10' 12'' W) at Ubatuba, São Paulo, from January 1993 to July 1994. This mangrove extends to the sides of the Comprido and Escuro rivers, which ensure the freshwater flow .

Only ovigerous females with recently extruded broods were used to estimate the fecundity. All females were measured at carapace width (CW) with a Vernier caliper nearest to 0.1 mm. Later, data was grouped in size classes with an amplitude of 2 mm.

Females were weighed in scales (0.01g) before and after egg removal. The eggs were carefully removed from the pleopods with the help of tweezers and brush. The fecundity of *A. pisonii* crab was estimated by the total count of the number of eggs stuck to the pleopods with the help of optical stereomicroscope, checkered chamber and manual counter.

Average fecundity was estimated for the different size classes. Also, fecundity was correlated with the size and the wet weight of females (W) (without brood mass). The variable cube carapace width (C) was used because it reflects a volume notion of the animal's body.

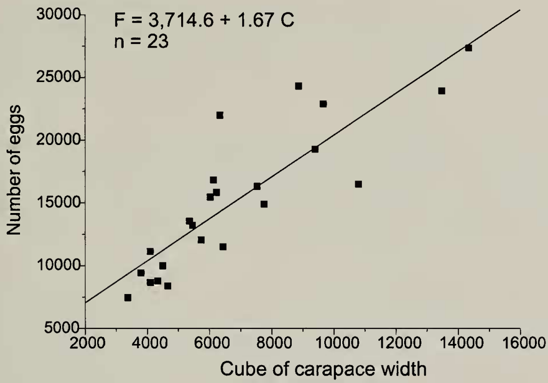
RESULTS

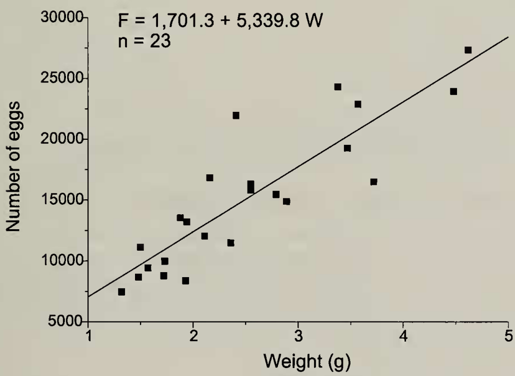
Twenty three ovigerous females were analyzed. The individual fecundity of *A. pisonii* ranged from 7,448 to 27,343 eggs. These values correspond to the lower (15.0 mm CW) and the higher (24.3 mm CW) analyzed ovigerous females. Average number of eggs obtained was 15,197 ± 5,771. The number of laiden eggs per female per brood ranged widely within the same size class (tab. I).

Table I. *Aratus pisonii* from Ubatuba. Average fecundity recorded for each size class of ovigerous females.

Size classes (mm)	Average number of eggs (x)	Standard deviation (s)	Number of ovigerous females
14 —] 16	9,162	1,543	4
16 —] 18	10,982	2,248	6
18 —] 20	16,110	3,114	7
20 —] 22	22,157	2,603	3
22 —] 24	20,202	5,523	2
24 —] 26	27,430	-	1

Linear regression of fecundity on cube carapace (C) width and weigth (W) shown a positive correlation (figs. 1, 2). The correlation between the number of eggs and the cube of carapace width may be expressed by the equation $F = 3{,}714.6 + 1.67\ C$ ($r = 0.86$; $p < 0.05$), where F = individual fecundity. The correlation between female weight without brood mass and the number of eggs may be expressed by the equation $F = 1{,}701.3 + 5{,}339.8\ W$ ($r = 0.88$; $p < 0.05$).





Figs. 1, 2. *A. pisonii*: 1, Correlation between number of eggs and cube of carapace width; 2, Correlation between number of eggs and weigth.

DISCUSSION AND CONCLUSIONS

The fecundity of *A. pisonii* increased in accordance with carapace width and the weight of the animals, as found in other brachyurans. CONDE & DÍAZ (1989a) obtained, for the same species, studied in a typically estuarine mangrove area of Venezuela, an average fecundity of 16,379 eggs. This result is somewhat similar to that which was obtained in this study. A population of *A. pisonii,* ocurring in a mangrove area with marine characteristics (high salinity) studied by DÍAZ & CONDE (1989), presented an average fecundity of 11,577. This abrupt difference in the average number of eggs between both populations is related with the average size of the individuals in each population under study and with the differential availability of energetic resources in the diverse environments. *A. pisonii* reaches larger sizes under typically estuarine conditions probably because this is an environment of greater productivity than marine one (CONDE & DÍAZ, 1989a). Furthermore, the availability of resources can have seasonal variations in the same environment as observed by RODRIGUEZ & CONDE (1989), who found local productivity differences in tropical estuaries throughout the year, with productivity increase during the rainy period, probably caused by the great inflow of nutrients carried by rivers. Thus, the number of eggs may also vary seasonally, as the feeding factor is paramount in the formation of vitellus.

The great variation in number of eggs within the same size class, as shown in this study, can be explained by a series of factors, such as: individual variation in egg production, seasonal variation in food availability, multiple spawns, besides the natural egg loss *in natura,* often related to crab activity over the substrate (HINES, 1982; HENMI, 1989).

Among brachyurans, multiple spawns may be verified through the observation of the continuity of gonad development during embryo growth (KNUDSEN, 1964; BAUER, 1989; SUMPTON, 1990; SANTOS, 1994). In this study, during laboratory observations, the presence of ovigerous females with developing gonads was verified, which suggests that the species presents multiple spawns. Meanwhile, the number of spawns which may occur and whether variations in the number of eggs really do occurr need further studies.

According to SANTOS (1994), multiple spawns is one of the factors which could explain the intense reproductive activity in certain periods. Considering that the incubation period is inversely proportional to temperature (WEAR, 1974; PILLAY & ONO, 1978; FUSARO, 1980) it may be suggested that, using the capacity to spawn more than once, together with the acceleration of the incubation time in periods of higher temperatures, the great number of ovigerous females found in this study in the warmer and rainier months is the result of a reproductive strategy in order to optimize offspring production in these periods, when environmental conditions seem to be favourable for larval output. On the other hand, the greater egg production by a population could be related to a strategy in order to compensate high larval mortality rates in plankton (HARTNOLL & GOULD, 1988).

Laboratorial studies revealed great plasticity in larval life cycles of *A. pisonii* with variations in the number of larval stages ranging from 2 to 4 zoeae before the megalopa (DÍAZ & BEVILACQUA, 1987). This plasticity can promote an increase of larval survival rate in field, as the reduction of the time of permanence in plankton — through reduction of larval phase — avoids predation (ANGER, 1995). Many of those mechanisms for offspring survival optimization correspond to adaptation to the diverse ecological factors (biotic and abiotic) which interact among themselves and with the population and favour the evolution of the processes of natural selection providing animals that are much better equipped to reach reproductive success.

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